All Muck and Magic?

- **Some new ideas we have tried for additions to the soil at Windmill**

Biochar

- **What is it?**

Biochar is what you get if wood or other dry enough biomass is heated without enough oxygen to burn. In the past this was done by placing turf and soil over a heap of wood with a fire set in it, but this is a tricky and wasteful process. Now there are a variety of techniques used, some of which allow liquids and gases to be captured to use as fuel. Biochar is used as a soil conditioner, following attempts to mimic the "terra preta" soils of countries like Brazil, because these soils rich in charcoal are also much more fertile than the surrounding soils.

- **Pro's**

The benefits of biochar are still being tested, and some of the theories of their benefits remain to proved, but the basic idea is that the structure of the charcoal provides a huge number of tiny holes that can soak up nutrients that would otherwise be washed out of soil. The hole network also gives places for fungi and other beneficial micro-organisms to develop, and a large area for chemical reactions to take place so that nutrients are made available to plants. It's been described as being like a coral-reef for soils. Biochar is said to stay in soil for decades or longer, so it is pushed by some as one way of storing more carbon in soil, which would help to reduce CO2 in the atmosphere if enough were stored. In addition, some studies show that it reduces methane and Nitrous Oxides being released by soil, which would make a large difference as these have a much stronger warming effect on the atmosphere than CO2.

- **Con's**

Some of the claims for the benefits of biochar are being challenged, especially how long the charcoal lasts in the soil. If climate-benefits are proved to be possible, there is still a difficult balancing act to be done so that valuable crop-residues aren't lost to biochar when they should be adding humus to the soil. However small amounts of biochar can be made instead of ash if modified stoves are used to control airflow, so heating and cooking could potentially be done at the same time. There is also a world-wide charcoal industry that produces some particles too fine to use for high-value charcoal. These might have more value for biochar than for making charcoal briquettes. And where organic wastes are burned to get rid of them, biochar may be a better use of the resource. Those against the increasing popularity of biochar are worried because there is already a clear use of land to grow biofuels when other uses or leaving it wild would be better for the environment. Scaling up to use biofuel in power stations clearly risks environmental problems

- **How to use it**

The charcoal is crushed into small pieces and soaked in compost tea or added to compost or manure heaps. This helps make sure the char gets filled with nutrients before use, rather than taking them from the soil in the bed. It is then added to the growing bed and mixed in.

At Windmill, the fines and residues from barbecue charcoal are crushed and added to the compost heap, along with charcoal formed during cooking fires in Winter. We are looking to collect fines from local charcoal makers and also hope to create a biochar stove.

Rockdust

- **What is it?**

Rockdust is a fine powder of rock, and is a waste product from quarrying and the sand and gravel industry. Because it is so fine, it has a large surface area, which means that soil microbes can act on it to release nutrients for plants.

- **Pro's**

The rock dust is claimed to have major benefits for crop growing. It has a high surface area to allow chemical processes to take place (some quarries sell a rather gritty mix which is less beneficial). This means that minerals in the dust can be used by crops growing in the soil. Rock dust can replace the minerals that can be lacking in soils that have been cropped for many years. It also helps make composting work better, with a greater range of soil life

- **Con's**

Rock dust must not be breathed in, as it can settle in the lungs and cause damage. The risk can be minimised by using it when it is moist and using masks if dust is coming off the product.
Rock dust from basalt quarries is considered the best, but this is expensive and means something heavy is being transported long distances by road. Try buying in bulk from a quarry, rather than by the 25kg bag from a garden centre. We got our rock dust from Wainwrights Moon Hill Quarry in the Mendips (www.wainwright.co.uk), rather than from the SEER Centre (http://www.seercentre.org.uk) which comes from a quarry in the Scottish Highlands. However, the dust from mixed gravel workings may be worth trying, and there are many in this area. If you get some, it's worth mixing some with compost and trying quick growing seeds in it to see if there seem to be any benefits.

•How to use it

Spread the dust on a still day, and when it is moist, or you will lose much of the dust. If there is any dust flying, wear a mask, and rake in or cover immediately to keep the dust in the soil rather than on the surface where it could be washed off. Rock dust is not beneficial in sterile conditions, so it's important to add plenty of compost to the soil, or adding it to the compost heap itself.

In 2013, we took a bulk delivery and added rock dust to most of the beds at Windmill, and also to some of the compost heaps. Because the beginning of the year was very wet, we took the decision to add dust everywhere rather than lose it to the weather, so it is difficult to say how much it has benefitted us, especially given the short growing season we had last year. However, we did get some excellent crops, especially of pumpkins and squash.

Waste Wood

- **What is it?**

Tree and hedge cutting produces a lot of waste wood that is often burned to get rid of it. If it is left to rot or chipped, and this is allowed to compost, it can have a lot of benefits for the soil.

- **Pro's**

In a natural system, rotting wood, twigs and leaves are important soil builders, especially because fungi will start to grow on them and help the rotting process. This fungi can help plants benefit from extra moisture as they link with the roots of growing things in the area. The strings of fungi roots (mycelium) are often missing in soils that get dug a lot.

By burying waste wood, or composting it instead of burning, we can reduce the amount of CO2 produced, and store more of it as humus in the soil.

- **Con's**

If wood chip is used fresh in the soil on a bed, it is likely to reduce the fertility of the soil as it rots, and the rotting uses up the nitrogen in the soil. However, if it is left to rot in a heap or on paths, there will be less effect. Wood chip from different sources will have different effects. Some will be much slower to rot, and some may have diseases that you would not wish to bring to your garden, so it is best to re-use what you cut locally, or to get wood chip from a tree-surgeon who can make sure they do not pass any diseases on to your trees.

- **How to use it**

We use our waste wood on paths between the beds in some areas. Once it has rotted down, we add it to the beds or to the compost heap, and then replace it wish fresh compost. We have also created a hugelkultur bed, which has a large area of rotted and un-rotted wood underneath it. This is mixed with fresh green waste and urine before re-covering with soil to make a "hill". See the separate sheet on Hugelkultur for more information.

The Windmill Hugelkultur bed being created